City of San Diego
Residential Photovoltaic Systems
Inspection Guidelines

The purpose of inspections by DSD staff is to ensure compliance with the California Electrical Code (CEC), other applicable codes and regulations, and the approved plans. The intent of the regulations is the practical safeguarding of persons and property from hazards arising from installation of solar systems. The following guidelines were developed to assist you with inspection process for the installation of the Photovoltaic (PV) system.

All equipment, array modules, inverters, racking, combiner boxes, DC disconnects, fittings, etc., shall be installed per approved plans and manufacturer installation instructions. All material and equipment shall be listed and labeled by an approved testing agency.

A. The Inspection Process:

It is the contractor or owner's responsibility to schedule and coordinate all required inspections and obtain approvals before covering or concealing any work. The contractor or responsible party shall be available at the jobsite and provide proper access for the inspector. Some inspections can be combined and/or eliminated if all of the new work and equipment is exposed and accessible. Some installations may require only a "final" inspection.

The following inspections are required:

For Ground Mounted Array Systems:

- Footings for array frame
- Underground Electrical (raceway and conduits)
- Final Inspection (complete system including modules, panel, wire terminations, grounding, etc.)

For Roof Mounted Array Systems:

- Rough electrical (for concealed wiring if applicable
- Roof array and bond (for integrated systems or tile roofs)
- Final Inspection

Inspection Checklist:

- Approved plans, inspection record card, and manufacturers' installations instructions shall be made available on site.
- Installation of equipments shall be as per approved plans. If the installation differs from approved plans, an additional plan review may be required.
- Work shall be ready for the inspection being requested.
- Roof and job site shall be accessible to perform the inspection requested.
- A ladder complying with CAL-OSHA requirements shall be made available and secured in place for inspection.
- When a required utility disconnect is located remotely, a SDG&E letter of authorization shall be available on site.
- For service upgrades, a SDG&E meter location approval and a completed City of San Diego circuit card shall be available on site.
- All required working clearances for electrical equipment must be provided and maintained.

B. Service Equipment:

- The service equipment and its verifiable bus rating shall be adequate and properly sized for the designed backfeed from the PV System.
- ☐ The service grounding and bonding connections shall be located and verified.
- ☐ All grounding requirements shall be verified on PV systems involving detached structures.
- Install a placard for all customer self-generation equipment in accordance with San Diego Area Electrical Newsletter available at www. iccsandiego.org.
- ☐ The installed circuit breaker shall be of the same manufacturer as the existing service equipment, or listed to be used for the existing service equipment.
- ☐ When existing multi-wire branch circuit breakers are relocated to accommodate the new PV breaker, loads must be balanced on the bus. Any relocated circuit breakers will require an updated panel schedule.

C. PV Array Installed on Roofs:

All roof mounted PV array modules and racking systems require inspection for wiring, attachments, and grounding. Due to the fragile nature of tile products, it is highly recommended

that the required roof array and bonding inspection be performed and approved before any roof repairs are initiated. Failure to coordinate this inspection as recommended may result in tile damage, requiring further repairs and inspections**.**

- The rack supporting modules should be positively attached to the supporting structure.
- PV modules and racking system shall be installed per approved plans and manufactures' installation instructions. The weather protection of roof membrane shall be maintained.
- Roof mounted arrays should not compromise or obstruct any roof vents, plumbing vent, chimney or any other existing items penetrating existing roof. Roof Class A fire rating shall be maintained with all PV installation.

D. Combiner Boxes, Junction Boxes, and Wiring Method:

- The source wiring conductors shall be of the approved type and properly sized.
- The metallic raceways containing DC source circuits over 250 volts shall be properly bonded through concentric knock-outs at boxes or enclosures (where applicable).
- The combiner boxes, disconnects and fusing used in source wiring shall be DC rated.
- All intermediate enclosures, boxes, and conduit body covers must be accessible for servicing and shall be properly grounded.

E. PV Inverters & DC Disconnects:

- The placard or label with the actual power source operating voltages and currents shall be affixed or located immediately adjacent to either the inverter or DC disconnect.
- The PV Dual Source / Back feed warning placard or label shall be affixed or located immediately adjacent to either the inverter or DC disconnect.
- The inverters, including model and size, shall match the approved plans.
- A properly sized system grounding electrode conductor shall be installed to the appropriate grounding terminal.
- ☐ Metallic raceway and conduits enclosing system grounding electrode conductors shall be bonded at both ends of the raceway.

F. AC Overcurrent Protection and Required Utility Disconnect:

- When a visibly open, lockable AC disconnect is required by SDG&E, it shall be located at the service equipment unless the Utility approves a remote location.

- When the Utility Disconnect is required, it shall be placarded to read "PV System Disconnect for Utility Operation."

- All back-fed circuit breakers and disconnects shall be appropriately labeled.

G. Service Upgrades Involving Scheduled Outages with Utility Company:

The deadline established by the Utility for receiving City approval to re-energize equipment is 1:00 p.m. To avoid a lapse in electrical service during a service upgrade which requires a scheduled outage, please adhere to the following procedure:

1. Schedule in advance a City inspection for the day of the scheduled outage.

2. On the morning of the scheduled outage, contact the inspector between 7:15 to 8:00 a.m. and inform the inspector that your inspection involves a scheduled outage for a disconnect/ reconnect.

3. Before the inspector will issue an inspection clearance to re-energize, the new service equipment must be installed, grounded and bonded. Any required service entrance conductors and raceways shall be installed to the SDG&E service point. If the panel is a flush or semi-flush type, flashing around the panel must be installed to protect the building's framing.

Due to narrow timeframe between the 8:00 a.m. disconnection of power and the 1:00 p.m. approval deadline, it is highly recommended that as much pre-wiring, grounding and bonding preparation work as possible, be completed in advance. Cut over wiring, branch circuit modifications, and the PV system can be inspected at a later date (if necessary) for final project approval.

Additional Resources and Information

The following resources provide additional information on various aspects of a residential PV installation or design:

Applicable Electrical Codes:
The current edition of the California Electrical Code (CEC). The CEC amends the National Electrical Code (NEC) and is adopted by the state of California. The CEC provides the minimum requirements for all Electrical installations including Photovoltaic Systems.

San Diego Area Electrical Newsletters:
Developed and published by the San Diego chapter of the International Code Council, the newsletters provide interpretation of CEC requirements that are generally acceptable to all San Diego area jurisdictions. The newsletter "Solar Photovoltaic Systems" addresses CEC and SDG&E requirements for PV installations.

Information Bulletin 301:
This bulletin provides detailed information on permitting procedures for installation of PV systems within the City of San Diego.

City Of San Diego "Plan Template"
This plan template was developed to assist PV installers prepare plans and documents for City of San Diego review and approval.

San Diego Gas & Electric Service Standards and Guide Manual:
The current edition of this manual provides specific design and installation requirements for all electrical distribution and service systems within the greater San Diego region.

Photovoltaic Systems by James P. Dunlap, in partnership with National Joint Apprenticeship Training Committee, ATP publisher.

Inspector Guidelines for PV Systems by Brooks Engineering. Visit their website at: www.brooksolar.com/services.html.

Photovoltaic Power Systems and the 2005 National Electrical Code: Suggested Practices *by* John Wiles.

Perspectives on PV by John Wiles at: http://www/nmsu.edu/~tdi/Photovoltaics/Codes-Stds/Codes-Stds.html. This site provides a series of articles on photovoltaic power systems and the National Electrical Code.